Pawnee-Buckner River Subbasin

Management Recommendations

Hodgeman/Ness County Version

January 12, 2004

Subbasin Water Resource Management Program
Division of Water Resources
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I. INTRODUCTION

The ground water resources of the Pawnee-Buckner River subbasin in Pawnee, Hodgeman and Ness counties are recognized to be vital in maintaining the area's economy. Major stream systems include Pawnee River (Creek), Buckner Creek and Sawlog Creek. Residents of the subbasin are highly dependent on the ground water resources for irrigation, municipal, industrial and domestic use. Water levels can be severely impacted during extended droughts due to increased withdrawals, creating more stress on the aquifer system and making recovery of water levels more difficult to obtain. Special programs are needed to address the fluctuations in water levels during these drought periods. The implementation of conservation programs and adoption of a drought contingency plan (DCP) will help preserve the water resources of the area and maintain stability in the economy. This plan does not attempt to address changes in water levels occurring since predevelopment. It is designed only to reduce the impact of increased pumping on the aquifer during droughts conditions.

II. BACKGROUND

A. Pawnee County

In 1976, residents of Pawnee County voted to become part of the Big Bend Groundwater Management District NO. 5 (District). The residents recognized the need for local input in managing the ground water resources of the area. The District was created to promote conservation and prevent economic deterioration through the stabilization of agriculture. Over the years, programs have been adopted and implemented by the District's Board of Directors in an effort to prevent long-term ground water declines. Programs implemented for Pawnee River Valley (PRV) include an aggressive safe-yield program designed to prevent long term water level declines and a well spacing regulation to prevent direct impairment. However, much of the agricultural development had taken place prior to the formation of the District and was not impacted significantly by these policies.

At the request of the District, the chief engineer, Division of Water Resources (DWR), Board of Agriculture in 1980, established an Intensive Groundwater Use Control Area (IGUCA) in the Pawnee River Valley. Changes to the safe-yield program in 1984 and eventual closure of the subbasin in 1990 to further appropriation have been the result of continuous efforts to address water level declines in many areas of the subbasin. The area remains closed to further appropriations with the exception of small use applications. Amendments to the Pawnee River IGUCA order would need to be established prior to implementation of the drought contingency plan and would follow the formal procedures outlined in the ground water management district act (K.S.A. 82a 1036 through 1040).

B. Hodgeman/Ness County

Portions of Hodgeman County were once included within the boundaries of Southwest Kansas Groundwater Management District No. 3. Local residents requested to be removed from Groundwater Management District No. 3 based on differences between the Ogallala aquifer and the Buckner Creek alluvium. In 1988, the chief engineer changed the boundaries of Groundwater Management District No. 3 to reflect the exclusion of Hodgeman County.

Groundwater Management District No. 3 continues to have local authority to regulate water rights within Ford, Gray and Finney counties, which encompass upper reaches of Pawnee, Buckner and Sawlog Creek.

In 1989, Kansas Department of Agriculture's Division of Water Resources (KDA-DWR) established a moratorium on future appropriations from Buckner Creek, Sawlog Creek, Pawnee River, their tributaries, alluviums and other hydraulically connected sources of water supply in Ness and Hodgeman counties. On October 25, 2002, the area was closed to future appropriations (K.A.R. 5-3-26).

C. State Water Plan

In July 1994, State Water Plan directs the need for further water resource management in the Pawnee River Valley. KDA-DWR was the agency identified as most appropriate to address the guidelines:

> *Implement a water management policy in the Pawnee River Alluvial Corridor that comprehensively addresses the differences in the area. Recommendations of the Hodgeman/Ness County Advisory Committee should be seriously considered. Status of the Pawnee River Valley Intensive Groundwater Use Control Area should be reviewed during the investigation (Kansas Water Plan, FY 96).*

In 1993, the Kansas Legislature authorized the formation of the Subbasin Water Resources Management Program (SWRMP). The program is a special project funded by the State Water Plan and implemented by KDA-DWR. The SWRMP is designed to use a proactive approach in developing long-term management strategies that further address water issues in selected subbasins. The SWRMP was established in the Pawnee-Buckner subbasin in 1996.

III. HYDROGEOLOGY

A. Aquifer Systems

Three aquifer systems exist in the Pawnee-Buckner subbasin, the alluvial, Ogallala-High Plains and the Dakota aquifer.

The hydrogeology of the Pawnee River Valley is best described in "Ground-Water Resources of Pawnee Valley, Kansas by V.C. Fishel" as follows:

"The area consists of gently rolling upland plains together with relatively flat flood plains and terraces. The largest water bearing formations in this area range geologically, in age from Cretaceous to Quaternary. The Cretaceous rocks are exposed in the uplands in, northern Pawnee County while the alluvium and terrace deposits underlie the principal valleys and the adjacent areas. The alluvial aquifer yields large quantities of water to wells. Other water bearing formations generally yield only small to moderate quantities of water to wells. The saturated thickness of the alluvium has a maximum thickness of 120 feet." (Pg 7)

The alluvium of Pawnee River Valley has a width of as much as three miles in parts of Pawnee County and as much as two miles in Hodgeman and Ness counties. The thickness of the alluvium ranges from 65 to 138 feet in Pawnee County to a maximum of 100 feet in Hodgeman and Ness counties.

The Dakota formation outcrops in isolated areas in Pawnee County but underlies all of the Pawnee River Valley and has a maximum thickness of approximately 200 feet (Pg 20).

The Dakota aquifer is both unconfined and confined in different portions of the subbasin. The confined Dakota is located in the western portion and the unconfined begins in eastern Hodgeman County and continues into Pawnee County. The Dakota and alluvial aquifers are hydraulically connected in areas where the Dakota is considered unconfined. Sustainable water levels in the confined Dakota aquifer are present due to water moving from the unconfined aquifer to the confined. The same phenomena have occurred between confined Dakota and Ogallala aquifers in the western portion of the subbasin. In addition, the Dakota aquifer discharges to the Buckner and Sawlog Creeks in southwestern Hodgeman County.

B. Ground Water

Between 1980 and 1988, the alluvial water levels either showed seasonal variations or a gradual decline along Buckner Creek and Pawnee River, while the years 1988 to 1992 show significant declines in water levels (Appendix C). Following 1992, the water levels increased significantly, attributed to large precipitation events in 1993, 1994 and 1997. The increase occurred following a large quantity of snowfall in winter of 1991-1992 and flooding in 1993. The precipitation ranges from 20 inches per year in Hodgeman County to 22 inches per year in Pawnee County. The average precipitation in the subbasin is approximately 21 inches per year. The average precipitation values are based on the Kalvesta, Bazine, Jetmore and Burdett stations.

Climatic conditions play an important role in the Pawnee-Buckner subbasin. When significant precipitation events occur, the alluvial system recharges rapidly leaving water stored in alluvial aquifer system to be used during dry periods. These significant precipitation events result in increased recharge to the alluvium and other areas able to detain water. If extended dry periods prevail, and the water table is significantly depleted, a substantial precipitation event(s) is necessary to replenish the system in order to support existing appropriations. Historically, when an extended dry period occurred, water levels declined due to an increase reliance on the water stored in the alluvial aquifer system with minimal recharge to the ground water system.

Recharge numbers represent vertical infiltration of precipitation falling on land surface. Examinations of hydrographs illustrate four large recharge events that occurred during this time and account for most of the water level changes. These recharge events were all associated with periods of high streamflow (April 1987, July 1992, August 1993 and November 1996). Recharge does occur at the surface, but with the top 30 feet of the lithologic column consisting of clay, infiltration could take many months to reach alluvial aquifer system. Therefore, it would appear flows from the Pawnee River and Buckner Creek have an immediate impact on recharge to the alluvial aquifer system.

The “Fishel” report further states significance of ground water levels:

"The water table in Pawnee Valley is not a stationary surface, but a surface that fluctuates up and down much like the water level in a lake or reservoir. However, over a long period a condition of approximate equilibrium exists between the amount of water that is added annually to ground-water storage and the amount that is discharged annually by natural means. In general, the water table rises when the amount of recharge exceeds the amount of discharge and declines when the discharge is greater than the recharge. Thus, changes in the water levels in wells indicate to what extent the ground-water reservoir is being depleted or replenished.

The factors controlling the rise of the water table in Pawnee River Valley are (1) the amount of precipitation within the valley that infiltrates through the soil and descends to the water table; and (2) the amount of influent seepage that reaches the aquifer system from the Pawnee River and its tributaries. In the Pawnee River Valley the water table is generally overlain by several feet of silt and clay, which retards and limits the movement of water down to the water table." (p. 42-43

Using data provided by DWR staff for a 23-year period from 1981 to 2003, changes in water levels were graphed. The year 1981 was selected as it was year when more irrigation wells were being measured by DWR and USGS staff. Prior to 1981water level measurement were not measured consistently. Using 31 wells located throughout Pawnee, Hodgeman and Ness counties within the subbasin. The water level measurement figures show the average water level measurement in 1981 was 37.18 feet to water, the average water level measurement in 2003 was 37.34 feet to water, and the average water level measurement for the 31 wells for 23 years is 36.38 feet (Appendix C). The largest increase in ground water levels for a single year was 61.64 inches; where as the largest decrease in ground water levels for a single year was 34.56 inches. However, on average, the data shows the Pawnee-Buckner subbasin has a variable ground water system over the last 23 years.

IV. WATER RIGHTS AND APPROPRIATED QUANTITIES

The Pawnee Watershed encompasses approximately 2,701 sq miles or 1,728,776 acres. There are approximately 741 water rights authorizing 943 points of diversion in the Pawnee Watershed, of which 151 are vested. Water appropriations for Hodgeman, Ness and Pawnee counties total 109,100 acre-feet, with 106,309 acre-feet appropriated for irrigation use and represents 97 percent of total authorized in the subbasin (Table 1).

While a reduction in other uses will be helpful, it is apparent that increased efforts in irrigation conservation and efficiency would be the most effective methods in sustaining water level fluctuations during drought periods.

COUNTY	AUTHORIZED AF	NO. WATER RIGHTS	IRR	REC	MUN	STK	IND	DOM
Hodgeman	**57,122**	**379**	**54865**	**742**	**397**	**1076**	**30**	**12**
Ness	**8,187**	**65**	**8187**					
Pawnee	**43,791**	**297**	**43257**	**135**	**361**	**13**		**25**
Total	**109,100**	**741**	**106,309**	**877**	**758**	**1089**	**30**	**37**

Table 1: Authorized quantity by county for all certified water use types

V. DROUGHT CONTINGENCY PLAN (DCP)

The amount of recharge to the aquifer system is in response to annual precipitation events, with intensity, time and duration all having an influence on the actual quantity reaching the aquifer. Since the annual amount of recharge cannot always be guaranteed, other methods must be evaluated to assure that drought conditions do not have prolonged effects on the aquifer. An enhanced management plan reducing water use will be the most effective in sustaining water level fluctuations during drought conditions.

The following plan is recommended for implementation in the Pawnee-Buckner River subbasin to reduce the impact on the aquifer system from ground water pumpage during drought conditions.

8. Current water level measurements are taken from 37 observation wells with additional measurements taken by the District throughout the subbasin. The committee shall determine the actual number and location of the observation wells used for this program with assistance from the District and DWR. The drought level point (DLP) value will be the average of the selected observation wells within a hydrologic unit, based on 40 percent reduction of the saturated thickness in Pawnee County. In Hodgeman and Ness counties, a 50 percent reduction of the saturated thickness will be used to determine an average water level that will be used as the DLP in each hydrologic unit. The water bearing sand point elevation to bedrock or bottom clay layer will be used to determine saturated thickness (Appendix B).

8. Water level measurements taken between January 15th and February 1st of each year will be used to determine the average annual change in each hydrologic unit and if the drought contingencies plan, should it be invoked. Water users will be notified by March 1st if DCP is to be implemented. If the subbasin receives significant recharge to raise the water table one foot above the pre-determined drought level point (DLP) the restrictions will not go into effect. Water users will be notified by April 1st of the same year the DCP is implemented, if chief engineer accepts recommendation.

8. The subbasin shall be managed by 10 hydrologic units (subunit) and be used to determine where water right restrictions should be imposed (Appendix A). The subunits are defined by USGS hydrologic unit code 14 contained within the Pawnee Watershed. A drought level point will be assigned to each subunit representing the average water level for that area. Each subunit will be then be addressed separately. Lithologic logs will be used to determine sand point to top of bottom clay layer or bedrock elevation in Hodgeman, Ness and Pawnee counties (Appendix B).

8. If the water table remains below the trigger level for a second year in the same hydrologic subunit, then the first year water use reductions should apply to adjoining contingent upstream and downstream subunits. If the water table remains below the trigger level for a third year the first adjoining contingent upstream and downstream regions may be reduced by the second years cut's of the management reductions in the following year. The second adjoining contingent upstream and downstream subunit may be reduced by the first year's reduction of the management reduction in the following

year.

8. Municipalities with wells in the Pawnee Watershed shall be required to file water conservation plans with the chief engineer upon adoption of this plan.

8. Owners of non-vested water rights shall be subject to the following water use restrictions when average February water levels are at or below the DLP in a subunit.

Drought Contingency Plan (DCP) water use restrictions shall be:

Year One:		
All end guns on sprinklers will be turned off for all water rights.		
Junior water rights	50 %	
Intermediate water rights		25 %
Senior water rights	10 %	
Vested water rights	0 %	
Year Two:		
All end guns on sprinklers will be turned off for all water rights.		
Junior water rights	50 %	
Intermediate water rights		50 %
Senior water rights	20 %	
Vested water rights	0 %	
Year Three:		
All end guns on sprinklers will be turned off for all water rights.		
Junior water rights	75 %	
Intermediate water rights		60 %
Senior water rights	30 %	
Vested water rights	0 %	

Table 2: Percent Reduction in water rights by priority for DCP reductions

The following are the break down of water right priority dates that will be used to determine percent reductions in water use for the drought contingency plan (Appendix B). The status of water rights will be reviewed by the committee every 10 years.

Junior water right:	January 1, 1981 to present date.
Intermediate water right:	January 2, 1963 – December 31, 1980
Senior water right	1945 to January 1, 1963 excluding vested rights
Vested water right	prior to 1945

Example of operation procedure for DCP:

Irrigation wells with overlapping water rights should be tabulated as one total water right quantity. Example would be if irrigator has overlapping water rights on a sprinkler system that are junior, intermediate, senior and vested, the total acre-foot quantity of the junior, intermediate and senior rights should be reduced individually, and then totaled as one quantity. If the first year cuts are in place for

a region the junior rights are reduced 50 percent, intermediate are reduced 25 percent, and the seniors are reduced by 10 percent. This way if the first, second and third year reductions occur, the field can still be irrigated using all the wells.

8. Dakota aquifer wells that have the alluvial water screen off will NOT be subject to the same restrictions as water users withdrawing water from the alluvial aquifer.

8. All water right restrictions shall be removed immediately if water levels increase by one foot over the DLP. Water levels are taken between January 15th and February 1st. If a significant rainfall event occurs, the District and the Division of Water Resources will conduct well measurements to determine if water levels have risen one foot above DLP.

VI. ENHANCED IRRIGATION CONSERVATION AND EFFICIENCY

Water conservation efforts have routinely been exercised throughout the Pawnee Watershed. However, increased efforts are necessary in order to sustain higher water levels. Utilization of existing weather stations should be promoted for irrigation scheduling. Educational activities should be conducted in the subbasin to promote irrigation scheduling and the most effective conservation measures. Cost share money should be directed to the subbasin to help offset the costs associated with irrigation upgrades and water conservation initiatives.

Between 1997 and 2002 approximately 54 system conversions have been made in the subbasin. The estimated total savings from system conversions is 4,488 acre-feet or 83 acre-feet/conversion. The average increase in irrigation efficiency is 21 percent. The following are estimated increase in efficiency based on system conversion:

- Flood to Center Pivot 15-40 percent
- Flood to Center Pivot w/end gun 8-23 percent
- Flood to Subsurface Drip 45 percent
- Impact to Drop Nozzle
    - 9 feet above land surface 10 percent
    - 4 feet above land surface 15-20 percent
- Lowering of Drop Nozzles
    - 9 feet to 2 feet 10 percent

The committee promotes continued construction of watershed dams throughout the Pawnee-Buckner subbasin. The Pawnee Watershed district office has shown that watershed dams contribute significantly to recharge in the immediate surrounding alluvial aquifer. The focus should be that dams are built and operated specifically for recharge to alluvial aquifer and not just flood control.

VII. FIVE YEAR WATER RIGHT PROGRAM

K.S.A. 2001 Supp. 82a-736 allows water users to deposit water into multi-year flex accounts and utilize water by means of a term permit over a five-year period with no annual limitation on the quantity of water used. Entry into the program requires 10 percent water conservation

component, proper and adequate meter, and can be filed no later than **October 10th** of the year proceeding the first year for which the application is made.

If the drought contingency plan is enacted water users participating in the Flex account program will not be exempt from water use restrictions. Water use will be based on water use restrictions as outlined in the IGUCA order.

VIII. PLAN IMPLEMENTATION

Upon the implementation of the management plan, the committee shall request a hearing be held by the chief engineer to amend the current IGUCA order for the Pawnee-Buckner subbasin.

DWR shall notify all water users, by mail, in the Pawnee-Buckner River subbasin of the hearing.

All conservation plans required for the municipalities must be submitted within one year after the revised order is enacted. All other water users shall be notified of the water right reduction.

Pawnee-Buckner representatives, the District and DWR will design the monitoring well network. The District and DWR will measure the wells between January 15th and February 1st each year and submit a report of hydrologic analysis to chief engineer.

The committee shall meet within two weeks after completion of water measurements to determine if the implementation of the DCP is necessary. If DCP is to be implemented, DWR shall notify water users by certified mail by March 1st.

DWR shall notify water users by certified mail when restrictions are lifted.

IX. NON-COMPLIANCE

A water right that has over-pumped allocation during the implementation of the DCP shall be subject to further reductions in water use. Violations will require additional reductions based on the following formula and, if necessary, shall be carried over into subsequent years if implementation period of the DCP continues. If water right have over-pumped and are subject to restrictions the following year and the DCP has been lifted those water users will be subject to continued pumping restrictions based on authorized quantity as outlined below for the following year. A clean slate is created during each DCP period.

First violation = 2 x the amount over-pumped
Second violation = 3 x the amount over-pumped
Third violation = pumping is ceased for one year

> **Example:** A water right with 100 acre-feet, during the second year of DCP implementation, is over-pumped by 10 acre-feet. The allocation for the next year of program implementation would be the restrictions plus 20 acre-feet decrease.

X. COMMITTEE RECOMMENDATIONS

The following recommendations are recognized as beneficial in the continued protection of the water resources in the Pawnee-Buckner River subbasin.

A. Advisory Committee

In February 1999, a committee was established to address water resource management issues in the Pawnee-Buckner subbasin and to develop water management strategies. The goal established by the committee was to develop proactive management strategies for long-term water resource management, which conserves water and maintains the availability of water for residents of the subbasin.

The initial advisory committee was formed as part of the SWRMP process to represent the Pawnee-Buckner subbasin in the development of comprehensive water management strategies. Robert Lewis, Larry Skelton, Lee Olsen and Jim Froetschner currently represent the residents of Pawnee County. Jim Cure, Lon Ruff, Tyler Selfridge and Walt Salmans represent Hodgeman County. Gary McJunkin and Larry Frusher represent Ness County. Representatives from Water Pack, the District and KDA-DWR were present at the meetings as technical advisors. The goal of the committee is to develop alternatives to protect future water supplies and maintain economic stability through water conservation and incentive based programs. It is recommended that the advisory committee continue to meet annually to review water level data, climatic changes, water use and other relevant data to recommend future needs as outlined in the proposed management plan to the chief engineer.

B. Representative Terms

Committee representatives must reside within the Pawnee-Buckner subbasin. Representatives shall be appointed by the water right owners within the subbasin and shall serve two year terms, or until a successor is appointed. The committee will consist of ten members, four from Pawnee County, four from Hodgeman County and two from Ness County. The chief engineer shall appoint the first term representative upon approval of the management plan. Elections shall be held each year for two members of Hodgeman and Pawnee counties. Ness County will elect one member every other year.

An eligible voter shall be any person who owns a water right, as per K.S.A. 82(a)-701 et. seq. within the boundaries of the subbasin. Each qualified voter shall be entitled to vote for as many candidates as the number of representatives are to be elected, but may cast only one vote for each representative. Duly authorized voters may also cast one vote for estates, trusts, municipalities and public corporations with water rights. Proxy voting shall be allowed.

The annual elections shall be held in conjunction with the Pawnee/Ness/Hodgeman Irrigation Association annual meeting. Notice of the meeting shall be published by DWR in at least one newspaper of general circulation in the subbasin prior to the meeting.

C. Additional Recommendations

1. The committee recommends **future appropriations to be allowed in the entire Pawnee-Buckner subbasin for new well applications**. As systems that are more efficient are installed (i.e. sprinkler system, surge valves and subsurface drip irrigation), the rate water is pumped from the aquifer is lessened. Therefore, dryland acres could be converted to irrigate acres if using center pivots without end guns, surge valves or subsurface drip irrigation with a minimum 90 percent efficiency. This would enable water users to increase irrigated acres and use same quantity of water allocated. To increase economic benefit of the subbasin more water should be allocated to irrigate more acres where they meet the current existing rules and regulations of well spacing and safe yield.

2. The committee promotes continued construction of watershed dams throughout the Pawnee-Buckner subbasin. The Pawnee Watershed district office has shown that watershed dams contribute significantly to recharge of surrounding alluvial aquifer. The focus should be that dams are built and operated specifically for recharge to alluvial aquifer and not just flood control.

3. Plugging of all Cedar Hills saltwater disposal wells in the subbasin should be recommended to the Kansas Corporation Commission to prevent potential contamination.

4. Exempt water rights within one mile of the Pawnee River from K.A.R. 5-25-2 (b) to allow water rights to be moved away from the stream. No water rights will be allowed to move closer to the stream. Program would only apply to Pawnee County water users. This does not apply to Hodgeman or Ness counties.

5. Recommend that the State's Water Right Purchase Program be implemented to purchase water rights from within one mile of the Pawnee River.

6. Recommend encouragement of conserving water by utilizing center pivot systems with drop nozzles and no end guns, subsurface drip irrigation, surge valves, watershed dams, terraces and implement any future irrigation technology. The Pawnee Watershed representatives should sponsor irrigation seminars to promote new technology in irrigation.

7. Recommend rate of diversion increase in Pawnee-Buckner subbasin.

   Where a total water savings can be shown, the rate of diversion may be increased to allow for maximum efficiency for irrigation**, however, still limiting the permitted acre-feet.**

   > **Example**: A 300 gpm well and the sprinkler installed needs 600 gpm. The irrigator can re-drill the well or add a new well so they can attain the 600 gpm maximum allowed for maximum irrigation efficiency.

   For this diversion increase it is recommended that the use of flow meters be utilized on all new wells. In addition, flow meters should be utilized on all existing wells. One meter will be required per point of diversion. Authorized multiple points of diversion that allow water flows to one point then one meter will be required to measure all water

pumped from all points of diversion authorized (K.A.R. 5-1-7) (Appendix C). A period of four years, from the acceptance of this management plan by the chief engineer, water users shall install flow meters that meet the specifications of rules and regulations (K.A.R. 5-1-4 through K.A.R. 5-1-12).

8. It is further recommended that single wells that are state certified at 400 gpm or less shall be exempted from flow meter requirements and electric meters shall be acceptable. There are 127 water rights for Hodgeman County, 11 water rights in Ness County and 30 water rights for Pawnee County with an authorized rate less than or equal to 400 gpm. The 138 water rights for Hodgeman and Ness counties are allocated for 11,575 acre-feet out of 65,309 acre-feet. That is 17.7 percent of the total allocated acre-feet in Hodgeman and Ness counties. This information was queried from WIMAS database provided by DWR on December 4, 2003 (Table 3).

County	**Authorized Acre-feet**	**Authorized Acres**	**No. Water Rights**
Ness	918	616	11
Pawnee	2442	3184	30
Hodgeman	10657	10687	127
Total	**14017**	**14487**	**168**
Note: Pawnee County wells are already metered			

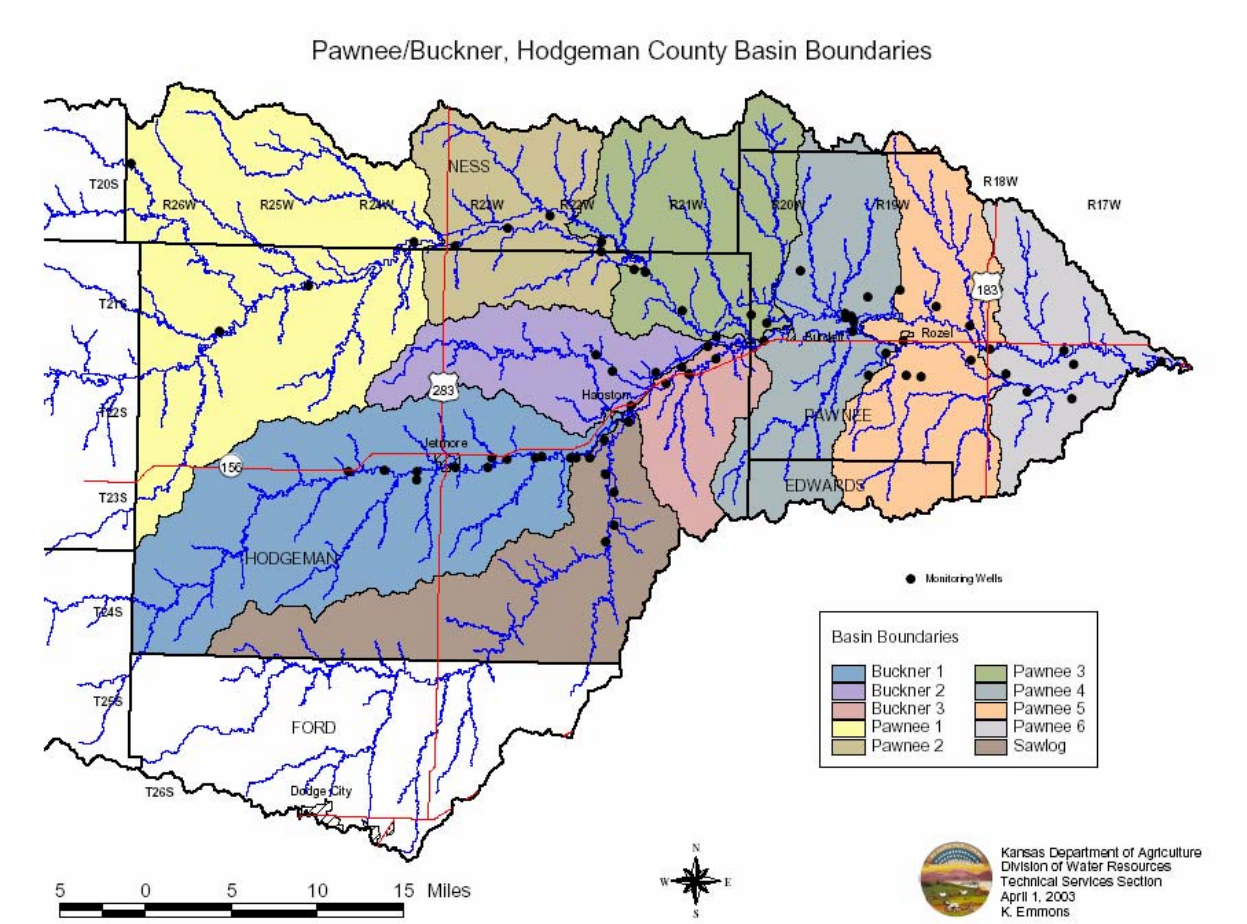
Table 3: Wells certified for 400 gpm or less

References

Fishel, V.C., "Groundwater Resources of Pawnee Valley, KS" p. 7, 20, 42-43.

Kansas Water Office, "Kansas Water Plan, Fiscal Year 1996", approved by the Kansas Water Authority July 1994.

Appendix A



Appendix B

Drought Level Point (DLP)

Pawnee 1:	Upper Pawnee River subunit (HG/NS) 35 Water Rights and 3 vested rights DLP = 35.298’ BLS
Pawnee 2:	Middle Pawnee River subunit (HG/NS) 41 Water Rights and 27 vested rights DLP = 43.456’ BLS
Pawnee 3:	Lower Pawnee River subunit (HG/NS) 58 Water Rights and 23 vested rights DLP = 66.518’ BLS
Pawnee 4:	60 water rights and 8 vested rights (PN) DLP = 50.44’ BLS
Pawnee 5:	94 water rights and 20 vested rights (PN) DLP = 49.74’ BLS
Pawnee 6:	67 water rights and 17 vested rights (PN) DLP = 46.98’ BLS
Buckner 1:	Upper Buckner Creek subunit (HG) 87 Water Rights and 18 vested rights DLP = 41.041’ BLS
Buckner 2:	Middle Buckner Creek subunit (HG) 37 Water Rights and 9 vested rights DLP = 50.602’ BLS
Buckner 3:	Lower Buckner Creek subunit (HG) 27 Water Rights and 14 vested rights DLP = 54.516’ BLS
Sawlog:	Sawlog Creek subunit (HG) 63 Water Rights and 12 vested rights DLP = 47.81

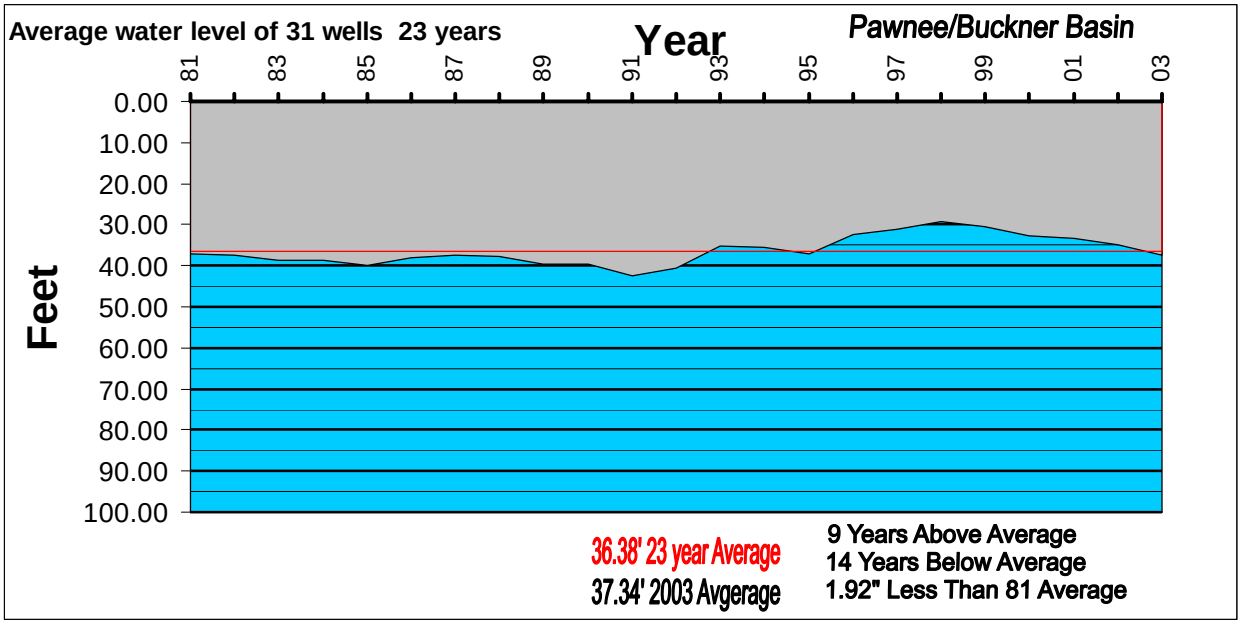
Subunit Name	*Management Priority*	*Total Acre-feet in*	*Total Number of*

		Subunit	*Water Rights*
Buckner 1	Vested	2119	19
Buckner 1	Senior	2437	21
Buckner 1	Intermediate	8735	58
Buckner 1	Junior	5542	23
Buckner 2	Vested	1686	9
Buckner 2	Senior	2444	11
Buckner 2	Intermediate	5071	19
Buckner 2	Junior	1419	9
Buckner 3	Vested	2881	14
Buckner 3	Senior	902	7
Buckner 3	Intermediate	1418	11
Buckner 3	Junior	1119	9
Pawnee 1	Vested	760	4
Pawnee 1	Senior	1136	6
Pawnee 1	Intermediate	2605	23
Pawnee 1	Junior	222	5
Pawnee 2	Vested	3431	27
Pawnee 2	Senior	936	9
Pawnee 2	Intermediate	3557	26
Pawnee 2	Junior	583	7
Pawnee 3	Vested	4524	23
Pawnee 3	Senior	4224	20
Pawnee 3	Intermediate	6069	39
Pawnee 3	Junior	0	2
Pawnee 4	Vested	1345	8
Pawnee 4	Senior	2315	13
Pawnee 4	Intermediate	7134	48
Pawnee 4	Junior	0	3
Pawnee 5	Vested	3746	19
Pawnee 5	Senior	2517	18
Pawnee 5	Intermediate	10,089	71
Pawnee 5	Junior	614	10
Pawnee 6	Vested	2579	19
Pawnee 6	Senior	4987	24
Pawnee 6	Intermediate	4654	42
Pawnee 6	Junior	51	2
Sawlog	Vested	1146	12
Sawlog	Senior	1913	7
Sawlog	Intermediate	7965	57
Sawlog	Junior	346	6

Water Rights Authorized In Each Subunit

Appendix C

Chart represents the average water level of 31 wells for 23 years



Meter Examples

An operator has two wells that run a center pivot system under one place of use. Operator will need to place the meter at a point where a total quantity of water can be measured from the two wells (Figure 1).